CONTROL OF HANDOVER AND TRANSMISSION POWER CONTROL OF MOBILE STATION IN A MOBILE TELECOMMUNICATIONS SYSTEM

RELATED APPLICATIONS

This is a continuation-in-part (CIP) of Application 08/591,557 now U.S. Pat. No. 5,898,925, filed on Jan. 11, 1996 which is a 371 of PCT/FI95/00249, filed May 10, 1995.

FIELD OF THE INVENTION

The present invention relates to methods and an arrangement for power control of a mobile station, and performing a handover in a mobile telecommunications system in which data is transmitted over the radio path between a mobile station and a base station.

BACKGROUND OF THE INVENTION

There are several multiple access modulation techniques for facilitating communications in which a large number of mobile users are present. These techniques include time division multiple access (TDMA), code division multiple access (CDMA) and frequency division multiple access (FDMA).

In TDMA radio telecommunication systems, time division communication in the radio path takes place in successive TDMA frames each of which consists of several time slots. In each time slot, a short information packet is sent as a radio frequency burst of a finite duration, which burst consists of a number of modulated bits. For the most part, time slots are used for the transmission of control channels and traffic channels. On the traffic channels, speech and data are transmitted. On the control channels, signalling between a base station and mobile subscriber stations is carried out. The Pan-European mobile system GSM (Global System for Mobile Communications) is an example of a TDMA radio system.

CDMA is a modulation and multiple access scheme based on spread spectrum communication. Unlike FDMA or TDMA, in CDMA a large number of CDMA signals (users) simultaneously share the same wide band radio channel, typically 1.25 MHz. Pseudorandom noise (PN) binary codes, so-called spreading codes, are used to distinguish between different CDMA signals, i.e, traffic channels on said wide band radio channel. A separate spreading code is used over each connection between a base station and a subscriber terminal. In other words, the narrow-band data signal of the user is conventionally multiplied by the dedicated spreading code and thereby spread in bandwidth to the relatively wide band radio channel. The signals of the users can be distinguished from one another in the receivers on the basis of the unique spreading code of each connection, by using a correlator which accepts only a signal energy from the selected spreading code and despreads its spectrum into a narrow-band signal. The other users' signals, whose spreading codes do not match, are not despread in bandwidth and as a result, contribute only to the noise and represent a self-interference generated by the system. The spreading codes of the system are preferably selected in such a way that the codes used in each system cell are mutually orthogonal, i.e., they do not correlate with each other. Thus, in the CDMA systems, the spreading code unique to each user or user's signal provides a traffic channel in a similar sense to a time slot in the TDMA systems. CDMA is described more detailly in the document: "An overview of the application of code division multiple access (CDMA) to digital cellular systems and personal cellular networks", Qualcomm Incorporated, 1992, USA, (Document Number EX60-10010).

In traditional TDMA and CDMA mobile communications systems, the maximum data rate at the radio interface is relatively low.

For communication in conventional mobile systems, each mobile station is assigned one traffic channel for data or speech transmission. Thus, a GSM system, for example, can have as many as eight simultaneous connections to different mobile stations on a same carrier frequency. The maximum data transfer rate on a traffic channel is restricted to a relatively low level according to the bandwidth in use as well as channel coding and error correction, for example in a GSM system to 9.6 kbit/s or 12 kbit/s. In addition, in a GSM system a half-speed traffic channel (max. 4.8 kbit/s) can be chosen for low speeds of speech coding. The half-speed traffic channel is established when a mobile station communicates in a specific time slot only in every second frame, in other words, in half-speed. A second mobile station communicates in every second frame in the same time slot. This is how the capacity of the system can be doubled as far as the number of subscribers is concerned, in other words, on the same carrier wave it is possible for up to 16 mobile stations to communicate simultaneously.

In the last few years, the need for high-speed data services in mobile communication networks has remarkably increased. Data transfer rates of at least 64 kbit/s would be needed to utilize, for example, ISDN (Integrated Services Digital Network) circuit switched digital data services. PSTN data services of the public telephone network, such as modems and telefax terminals of class G3, require faster transfer rates, such as 14.4 kbit/s. One of the growing areas of mobile data transfer requiring higher transfer rates is the mobile video service. As examples of this kind of services, security control by cameras and video databases can be mentioned. The minimum data transfer rate in video transfer can be, for example, 16 or 32 kbit/s.

The data transfer rates of the present mobile communication networks are not, however, sufficient to satisfy this kind of new needs.

SUMMARY OF THE INVENTION

It is an object of the present invention to enable higher data transfer rates in mobile communication networks.

Another object of the invention is a handover and power control in connection with high-speed data transmission.

This object is achieved by a method for power control in a mobile telecommunications system, said method comprising:

- allocating the mobile station at least two parallel traffic channels for high-speed data transmission over the radio path between a mobile station and a base station of a fixed radio network, transmitting a data signal over said allocated traffic channels,
- measuring the characteristics of the received data signal, such as signal level and/or quality, at the mobile station in each of said allocated traffic channels,
- controlling the transmitting power of said base station on the basis of a combination of measurement results of two or more of said allocated traffic channels, or on the basis of a measurement result of the poorest one of said allocated traffic channels.